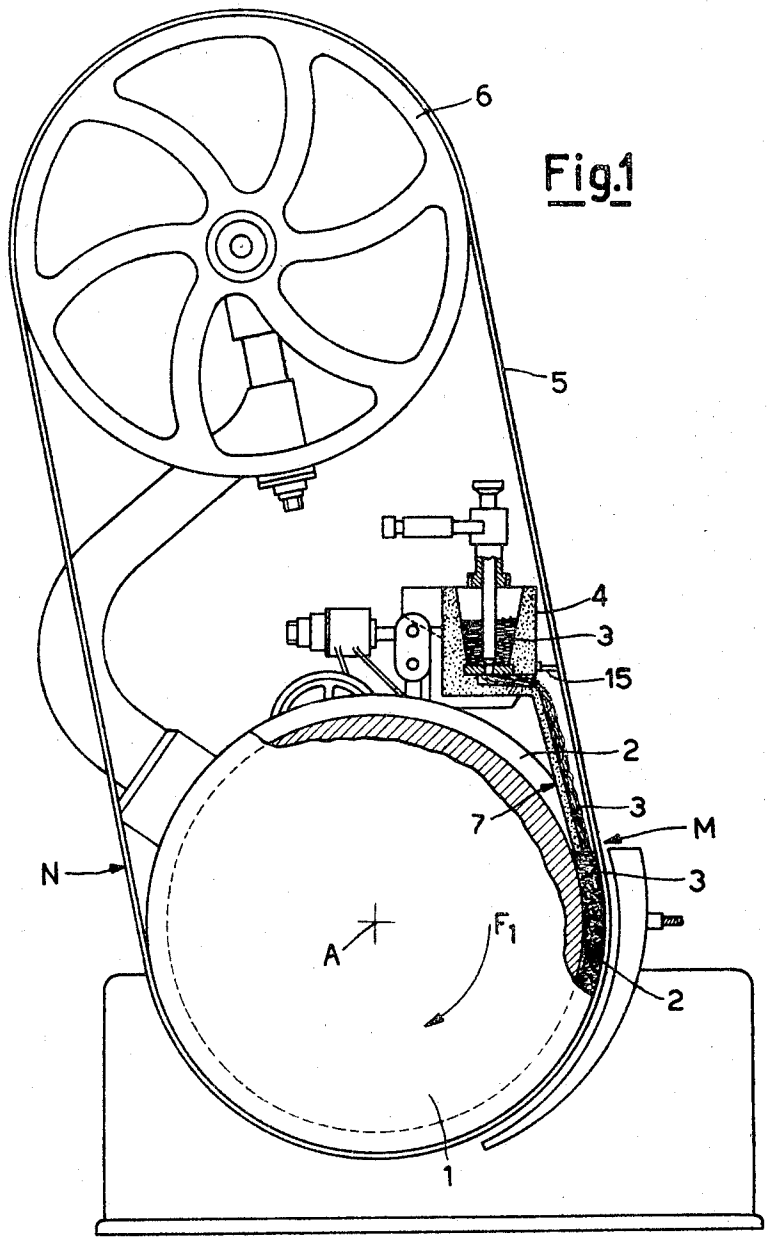
Jan. 21, 1969 I. PROPERZI 3,422,881

DEVICE FOR FEEDING MOLTEN METAL INTO THE PERIPHERAL GROOVE OF A CONTINUOUS CASTING WHEEL FOR THE PRODUCTION OF METAL BARS OR INGOTS

Filed Feb. 23, 1966 Sheet 1 of 4

Fig.1



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DEVICE FOR FEEDING MOLTEN METAL INTO THE PERIPHERAL GROOVE OF A CONTINUOUS CASTING WHEEL FOR THE PRODUCTION OF METAL BARS OR INGOTS

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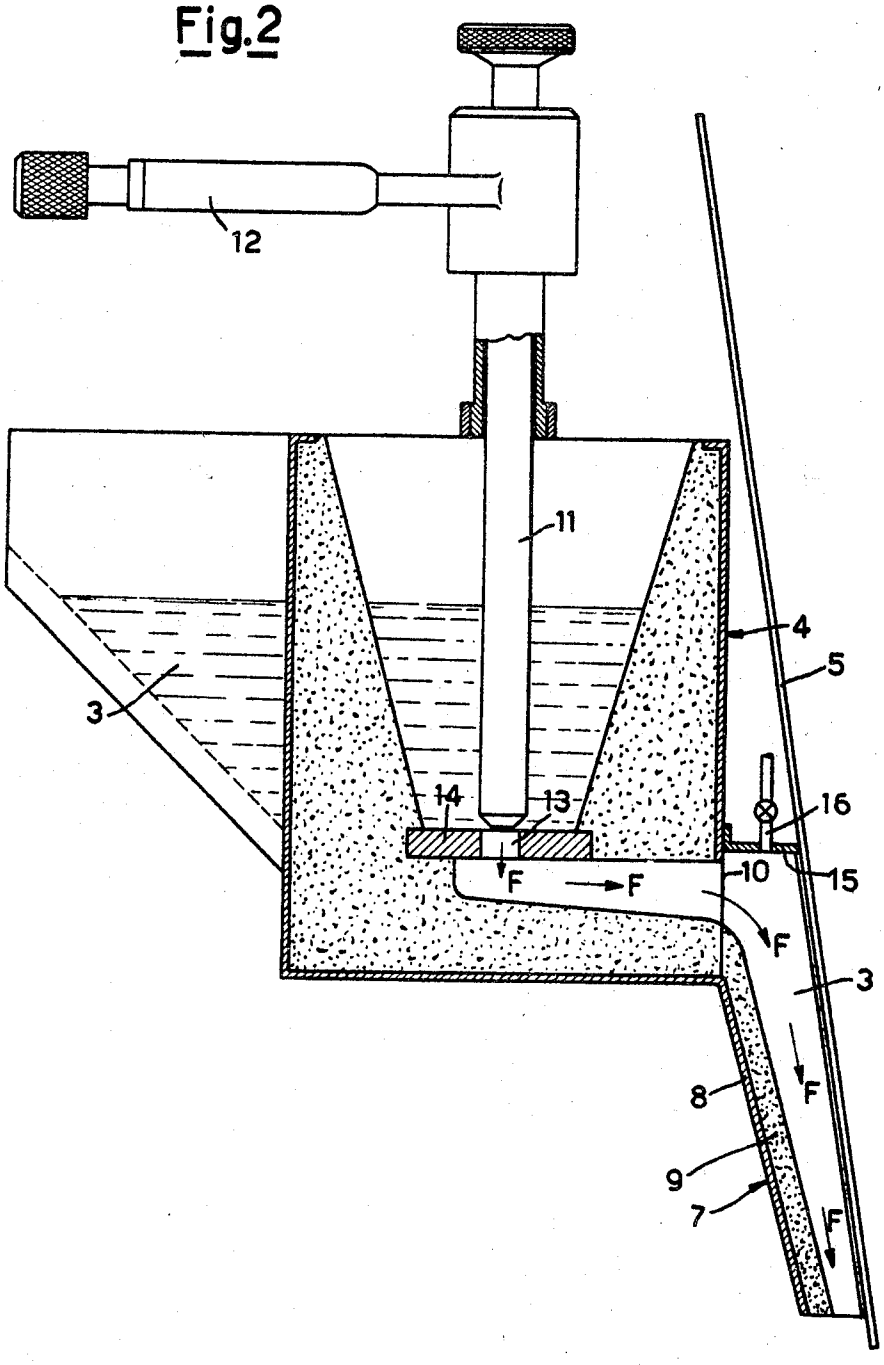
Fig.2



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DEVICE FOR FEEDING MOLTEN METAL INTO THE PERIPHERAL GROOVE OF A CONTINUOUS CASTING WHEEL FOR THE PRODUCTION OF METAL BARS OR INGOTS

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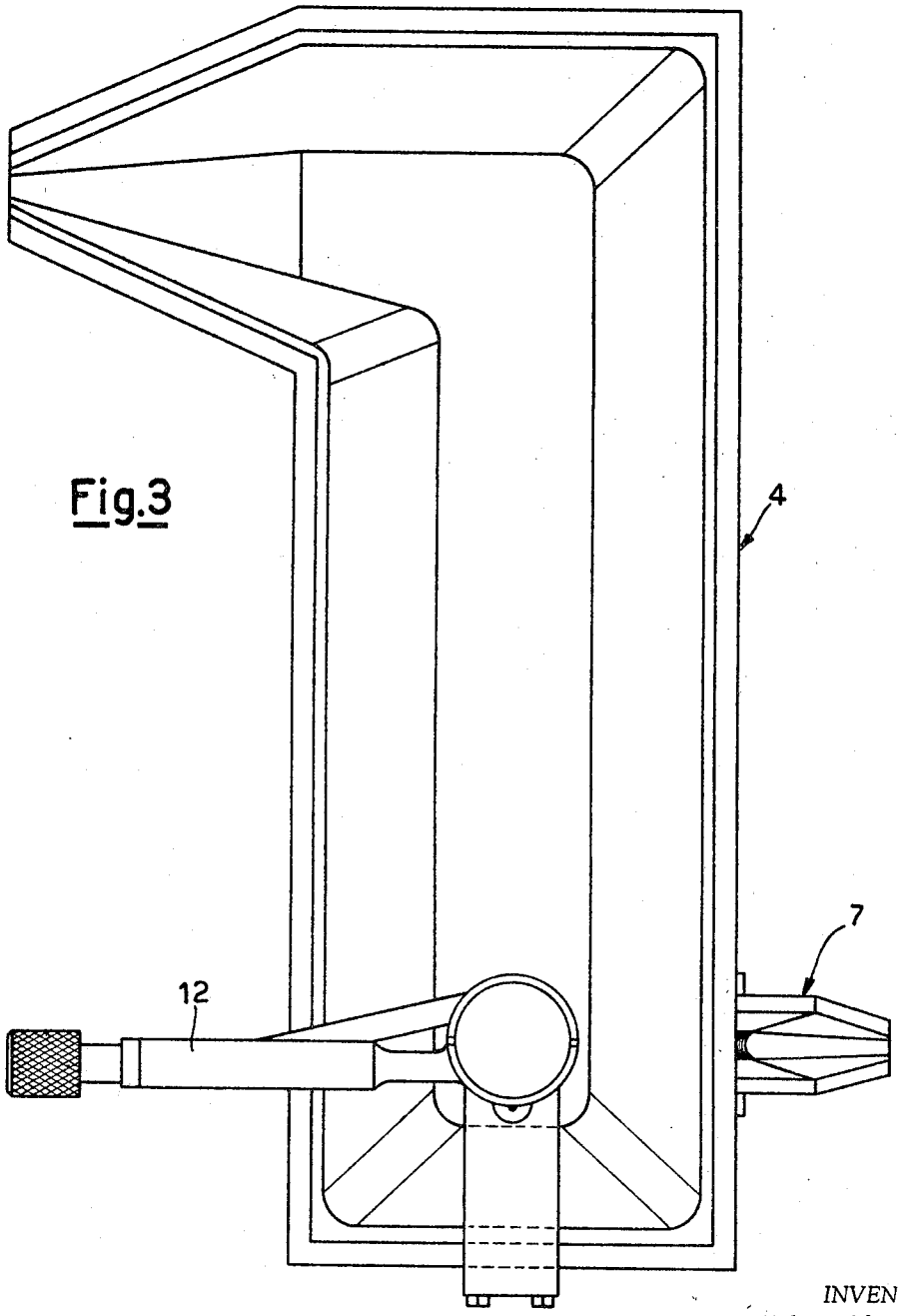
Fig.3



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DEVICE FOR FEEDING MOLTEN METAL INTO THE PERIPHERAL GROOVE OF A CONTINUOUS CASTING WHEEL FOR THE PRODUCTION OF METAL BARS OR INGOTS

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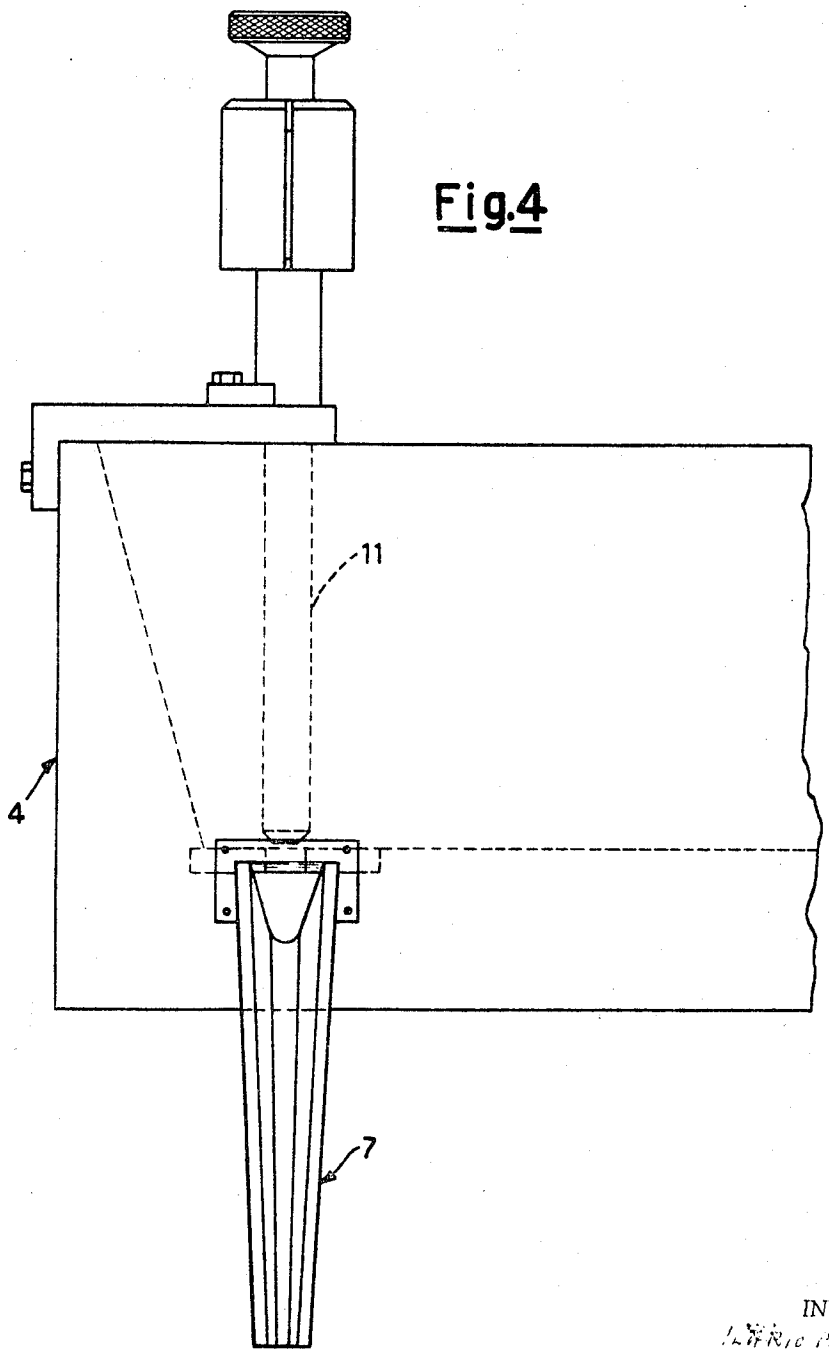
Fig.4



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3,422,881

DEVICE FOR FEEDING MOLTEN METAL INTO THE PERIPHERAL GROOVE OF A CONTINUOUS CASTING WHEEL FOR THE PRODUCTION OF METAL BARS OR INGOTS

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ABSTRACT OF THE DISCLOSURE

In a continuous casting machine a rotatable casting wheel has a circumferential edge face provided with a circumferential casting groove. An endless travelling belt is looped about the wheel and has an inner surface engaging the edge face of a portion of arc to define in the region of engagement a travelling mold cavity. A supply means for supplying molten metal is arranged adjacent the wheel and includes a nozzle member communicating with the mold cavity. The nozzle member is configurated as a channel-shaped conduit having an open side which faces the inner surface of the belt and is closed thereby.

The present invention relates to an apparatus for the continuous casting of metals, such as for example copper and its alloys, of the kind comprising a wheel fitted with a peripheral groove whereinto molten metal coming out of a crucible is continually fed. Along a certain portion of arc of the wheel, said groove closed by a tape resting upon the periphery of the wheel so as to hold, within said groove, the molten metal as the solidification of said metal is initiated and then completed. As a matter of fact, the metal issuing from the crucible enters the groove substantially at the point (fixed in space) at which the initial contact between the same and the periphery of the wheel takes place, and the metal is cooled off and solidified before the wheel has turned through an angular distance corresponding to the portion of arc over which the tape contacts the wheel, so that the metal is solidified before it reaches the point at which the contact between tape and wheel ceases. The solidified metal leaves the groove in the form of a bar, or an ingot.

The cross-sectional shape of the ingot is the same as that of the groove in that, as outlined above, the metal solidifies in an enclosure which is confined by the surface bounding the groove and by that of the groove-closing tape.

In an installation of the kind referred to it is known to provide a cooling system employing water jets for cooling the surfaces bounding the groove wherein the ingot is formed.

An installation of this kind allows the continuous formation of a metal ingot which may then undergo further treatment, as by rolling.

In known installations of this kind, a nozzle is provided through which the molten metal is poured from a crucible into the groove of the casting wheel. This nozzle is of substantially tubular configuration, and precisely because of its particular shape, the nozzle presents some definite manufacturing difficulties.

The inventive device for feeding the molten metal into the casting-wheel groove, which overcomes these difficulties as will clearly appear hereinafter, and, furthermore, affords remarkable advantages, is essentially characterized in that the nozzle for feeding the molten metal from the crucible into the casting-wheel groove is shaped as a trough having an opening along one side, said opening

being closed by the same metal tape which engages the casting wheel so as to close the casting groove thereof over a portion of arc.

In order that the features of the inventive device may become fully apparent along with the advantages stemming therefrom, an exemplary embodiment will be described hereinafter with the aid of the accompanying drawings, wherein:

FIGURE 1 is a diagrammatical showing of an installation which comprises a casting wheel, as viewed in elevation and partly in section;

FIGURE 2 is a fragmentary close-up view which shows a crucible and nozzle;

FIGURE 3 is a plan view, also on an enlarged scale as compared with FIG. 1, of a detail showing the crucible and the nozzle; and

FIGURE 4 is illustrative, still on an enlarged scale with respect to FIG. 1, of a detail comprising a part of the crucible and the nozzle, as viewed in elevation.

The casting installation for the formation of metal bars or ingots (for example of copper and its alloys) comprises a casting-wheel **1** which is rotatable about the axis A and provided with a peripheral groove **2** whereinto the molten metal **3** coming from a crucible **4** is fed. A flexible metal tape **5**, which is partially wrapped about both the wheel **1** and an upper wheel **6**, closes the groove **2** along a portion of arc which extends from a point M, in correspondence with which the molten metal enters the groove, to a point N whereat the already solidified bar leaves the groove.

For feeding the molten metal coming from the crucible **4** into the groove **2**, the present invention provides a nozzle **7** which is fixedly attached to said crucible.

The nozzle **7** has the shape of a trough, that is it has at one side an opening which is closed by the same tape **5** which is in contact with the wheel **1** to partially close the groove **2** thereof. In the upper portion, the nozzle **7** is closed by a wall **15** penetrated by a small tube **16** for feeding oxygen (or inert gases such as argon, nitrogen and the like) into the nozzle **7** so as to improve the properties of the ingot.

In the example shown, the nozzle **7** comprises a portion **8** of metallic material and a portion **9** of refractory material.

The nozzle is affixed, by means of screws or otherwise, to the crucible **4**, in correspondence with the line **10**, which is the line of contact of the nozzle with the crucible.

In FIGURES 3 and 4, in order to give a clearer showing of the nozzle which otherwise would have been hidden by the tape, said tape **5** has not been shown and the same is true of the wall **15**, so that the trough-like configuration of the nozzle can clearly be seen, it being understood, however, that the tape **5** closes the open side of the nozzle while the wall **15** closes the upper end of said nozzle.

The cross-sectional area of the nozzle tapers downwardly, i.e. the nozzle is thinned out and the lowermost tip of the nozzle which has the smallest cross-sectional area, extends somewhat into the groove **2** of the casting wheel.

The device for feeding the molten metal into the casting wheel is supplemented by a system comprising a vertically displaceable rod **11**, adapted to be actuated by a control lever **12** to thereby extend into and vary the cross-sectional area of a passageway **13** formed in the bottom wall **14** of the crucible so that, by varying the vertical position of the rod **11** and thereby the cross-sectional area of the passageway **13**, the flow of the liquid metal through the passageway **13** is also varied.

In the operation of the installation described above,

the liquid metal (e.g. copper) issues from the crucible 4 via the passageway 13 and advances in the nozzle 7 (along the path indicated by the arrows F) from where it enters the groove 2 at the point M.

It should be noted that, as the liquid metal moves along the trough-shaped nozzle 7, spilling is precluded out due to the presence of the tape 5 which tightly closes the open side of the nozzle 7.

The wheel 1 is rotated in the direction of the arrow F_1, the nozzle 7 being of course stationary. The tape 5 engages the wheel 1 and closes the groove 2 over the portion of arc whose extremities are identified with M, N, respectively, maintaining the metal in the covered groove portion until it is cooled and issues at the point N in the form of a bar of infinite length.

The inventive nozzle 7, on account of its trough-shaped configuration, is very easily manufactured. Furthermore, due to its shape and the adherence of the tape 5 (which forms a wall closing both the open side of the nozzle 7 and a portion of the groove 2 of the wheel), the feeding of molten metal into the groove 2 is more precise than otherwise possible.

Furthermore, the trough-shaped configuration of the nozzle facilitates and speeds up the usual upkeep and cleaning operations.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a continuous casting machine of the type comprising a rotatable casting wheel having a circumferential edge face provided with a circumferential casting groove therein, an endless travelling belt looped about said wheel and having an inner surface engaging said edge face over a portion of arc for closing a corresponding portion of said groove and defining a travelling mold cavity therewith, and supply means arranged to supply molten metal into said mold cavity and including a nozzle member communicating with said mold cavity, the improvement consisting in configurating said nozzle member as a channel-shaped conduit having a closed upper

end portion and an open side facing said inner surface of said belt and being closed thereby.

2. In a casting machine as defined in claim 1, said nozzle member having an outlet end communicating with said mold cavity, and converging in the direction toward said outlet end.

3. In a casting machine as defined in claim 1, said nozzle member having an outlet end configurated so as to be receivable in said groove, and extending into the same upstream of said mold cavity.

4. In a casting machine as defined in claim 1, wherein said groove has a predetermined cross-sectional dimension, said outlet end of said nozzle member having an outer dimension smaller than said predetermined cross-sectional dimension and extending into said groove.

5. In a casting machine as defined in claim 1, wherein said groove has a predetermined cross-sectional dimension, said nozzle member having an inlet end communicating with said supply means and an outlet end having an outer dimension smaller than said predetermined cross-sectional dimension and extending into said groove.

6. In a casting machine as defined in claim 9, said nozzle member having at said inlet end thereof an outer dimension greater than at said outlet end and tapering in direction from said inlet end to said outlet end.

References Cited

UNITED STATES PATENTS

379,096	3/1888	Brooke	164—277
1,671,360	5/1928	Fletcher	164—278
2,640,235	6/1953	Hazelett	164—87
2,659,948	11/1953	Properzi	164—278
2,659,949	11/1953	Properzi	164—278

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